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(54) A BOARD OF WOOD MATERIAL HAVING DECORATIVE LAYERS ANCHORED TO SURFACE THEREOF

(71) We, E. HOLTZMANN & CIE AG., a German Body Corporate, of 7566 Weisenbachfabrik (Murgtal/Baden), West Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a board of wood material having a decorative layer anchored to the surface thereof.

The surface treatment of wood fibreboards and flat pressed particle boards, so-called "chipboards", using carrier strips impregnated with hardenable condensation resins is already known. These are pressed, under the action of heat, on to one or both surfaces of the boards. The impregnated carrier strips generally contain considerable proportions of pigments having a relatively high refractive index, e.g. titanium dioxide, iron oxide, zinc sulphide, chromate, or organic dyes. In the untreated state they are known as decorative papers. Such decorative papers are manufactured, printed and unprinted, with basis weights of 60 to 150 g/m² and pigment contents of up to 35%. Depending on the given technical requirements, these decorative papers are treated with resin in an amount up to about 100 to 200% by weight, referred to the weight of the paper. The paper thus treated can then be pressed, under the action of heat, on to the surface of chipboards and the like.

Various completely condensed paper or non-woven impregnated materials in foil form which are provided on their rear side with heat seal coatings are known. These may likewise be pressed on to chipboards or similar supports under the action of heat. In this connection, the top surfaces of such materials are coated with lacquers corresponding to the proposed application, which can be applied both before and after the pressing procedure. In the case of these paper or non-woven impregnated materials the amount of resin impregnated is at most only 50 to 100%, referred to the weight of the paper, so that the foil to be glued to the wood surface has a sufficient interlaminar strength throughout its layer thickness.

The replacement of heat seal coatings of such foils by the use of interposed thermoplast foils is also known, and has achieved a certain degree of importance, particularly for coating relatively thin chipboards up to 6 mm thick.

It is known to use decorative laminate plates for surface coating purposes, said plates being stuck to the appropriate wooden materials by means of a glue based on polyvinyl acetate, urea-melamine, or so-called solvent adhesives.

The prior art is further augmented by processes in which the chipboard surfaces are directly coated by means of liquid or pasty, and in general pigmented, lacquer systems. Foils consisting exclusively of thermoplastic material are likewise applied by means of suitable adhesives to wood materials, using known methods.

Finally, papers the contain synthetic fibres are also known. These can be heat sealed and can be ironed on various surfaces. On account of the nature of the paper however there is insufficient interlaminar strength in the case of fairly thick layers, with the result that thicker layers tend to crack and some of the layer flakes or peels off, particularly at mechanically damaged sites.

All the prior art coatings are substantially based on the requirement that the wood material, on account of its relatively poor resistance to environmental factors such as light, temperature, moisture, alkalis, acids, solvents and detergents, has to be protected by a surface layer. In this connection, an attempt will be made to improve the in many cases unattractive board surface by suitable decoration. For many applications the mechanical strength of this surface is also intended to be increased by the surface coating.

Wood fibreboards as well as flat pressed particle boards are particularly used in interior construction work and in furniture

manufacture, in which connection high quality requirements are placed on the strength of the material and also on its optical appearance characteristics. The requirements placed on such processed wood materials cover a wide spectrum and require the manufacturer, while giving priority to economic aspects, to produce the widest possible harmonization with the area of application and the resultant use properties. Thus, for example, a kitchen work surface has to withstand stresses as regards chemical resistance, temperature resistance and scratch resistance, that are quite different to those that a cupboard rear wall, which generally only has a decorative function, possibly combined with a limited degree of washability, to fulfil. It is therefore desired that the surface coating for a given base material can be easily adapted, and without costly modifications of the manufacturing process, to specific areas of application.

The object of the present invention is to provide a board of wood material having a decorative layer which can be produced in many different embodiments at a favourable cost.

A paper sheet-like product, formed as starting material, can be pressed, by the action of heat and pressure, onto the surface of wood materials such as wood fibreboards and flat pressed particle boards. Such a non-woven fibre material offers the possibility for the first time of completely covering and colouring the substrate (wood material) by the thermoplasticization method, with basis weights of less than 100 g/m², for example 60 g/m², and pigment proportions of between 20 and 30%, depending on the shade. It is found by calculation that with a 60 g/m² basis weight foil, 12 to 18 g/m² of pigment may be applied.

Accordingly, the present invention provides a board of wood material having a decorative layer anchored to the board surface by heat and pressure wherein the layer comprises at least one thermoplasticized sheet-like support which, prior to being anchored to the board, has a basis weight of less than 100 g/m² and comprising a non-woven fibre material containing a predominant proportion by weight of thermoplastic synthetic fibres less than 8 mm in length and at least one pigment having a refractive index greater than 2·0.

In contrast to the conventional methods, such a sheet-like support does not require any additional treatment with resin, since the desired foil character is produced by the thermoplasticization. The decorative layer surprisingly can be securely anchored to the most widely differing types of wood surfaces without having to employ further measures, and using only the effect of temperature and pressure. The sheet-like support, which is initially like paper and has relatively low strength values, hardens and consolidates under the effect of temperature and assumes a foil character as soon as anchoring has taken place. The initial flexibility of the sheet-like support and its paper-like character have opened up quite new ways of afterforming, which hitherto led to difficulties in the case of the relatively brittle impregnated materials. On account of its thermoplastic character, such a sheet-like support has excellent embossing properties. Relatively stable veneer textures can for example be applied. In addition, the sheet-like support is extremely suitable as a printing support for decorative photogravure printing.

Of great economic advantage is the fact that by applying specific lacquer systems, possibly based on alkyd resins, an absolutely reliable hot mould release is ensured, which means that processing can be carried out on so-called short cycle presses. Similarly, by means of appropriate lacquer systems, preferably of a cross-linked type, on the one hand an additional surface protection and on the other hand an adhesion adjusting property for further coatings, possibly based on nitro laquers, are created.

Preferably, the sheet-like support comprises cellulose, whose proportions are between 20 and 50% by weight, of the total fibre weight. By virtue of the presence of cellulose, the non-woven fibre material remains substantially dimensionally stable, in contrast to pure thermoplast foils.

In order to provide a better bonding of the pigments and thermoplastic fibres to the cellulose, it may be advantageous in this connection to use for example one or more cationic polyamide resins as additives, for example in an amount of 0.1—1.2% by weight oven dry, of the total fibre weight.

In order to improve the manufacturing process, the non-woven fibre material preferably contains hydrophilic polyethylene and/or polypropylene fibres. It is expedient if the non-woven fibre material has a relatively high air permeability. In this way it will be possible, even after applying the decorative layer, to carry out drying processes or reactions in which moisture or reaction gases can pass substantially unhindered through the porous non-woven fibre material.

Pigments such as titanium dioxide, zinc sulphide, iron oxide, chromium oxide, lead chromate, lead molybdate, and organic pigments, are suitable for use, individually or in a mixture.

A laminate comprising a board of wood material, in particular a chipboard with a decorative layer anchored to the board surface under the action of heat and pressure, and which contains thermoplastic synthetic fibres, is constructed in such a way that the

decorative layer comprises a thermoplastic non-woven fibre material with a predominant proportion by weight of thermoplastic synthetic fibres, and the thermoplastic synthetic fibres together with the pigments and additives form a layer of high interlaminar strength. In particular, the high interlaminar strength that is produced is regarded as one of the especially advantageous properties of such a coating for wood materials and substances.

In this connection, the decorative layer may consist of a plurality of non-woven fibre materials thermoplasticized together. By laying one or more sheet-like supports on top of one another, the layer thickness and the surface properties may easily be adjusted in a desirable manner to the given objective.

It has also surprisingly been found that the thermoplastic non-woven fibre material combines, during the pressing stage, with duroplasts of high strength. Thus, the thermoplasticized sheet-like support may basically be bonded both to a duroplastic substrate and also to a duroplastic covering layer for purposes of mechanical surface protection.

Obviously, the thermoplastic nature of the non-woven fibre material also enables a thermoplasticization or a thermoplastic forming stage, e.g. via heated roller systems, to be carried out before the anchoring to the wood material, which under certain circumstances can provide advantages for a subsequent lacquer application as regards the absorption behaviour, and also an improvement in the printability, particularly in photogravure work.

Compared with the gluing technique using aqueous adhesives, the dry laminating of wood substances with a sheet-like support has the advantage that swelling phenomena are practically excluded, and for example deformation of flat surfaces is thereby prevented.

A non-woven fibre material may be obtained if the thermoplastic synthetic fibres in a minimum proportion above 50% by weight, together with the cellulose and a content of pigments having a refractive index greater than 2.0 in an amount of up to 35% by weight, are extracted as a non-woven fibre material from an aqueous pulp in the paper manufacturing process. A particular advantage is the fact that the non-woven fibre material can be produced on a conventional paper or non-woven material machine.

The application of decorative layers to board surfaces enables an economic surface coating for wood substances of various types to be obtained, which uses a plasticized non-woven fibre material, as starting substance, that can easily be prepared in a basic form similar to paper, and that can be stored in a small amount of space in various decorative embodiments.

EXAMPLE OF EMBODIMENT:

500 kg of hydrophilic polyethylene fibres (average fibre length 1.5 mm) are added to 10,000 l of water.

In a second batch

180 kg of birchwood sulphate cellulose,
90 kg of spruce sulphite cellulose,
50 kg of titanium dioxide (rutile) and
220 kg of iron oxide pigment

are added to and dispersed in 8,000 l of water, and refined by disc refiners to 35° (according to Schopper-Riegler).

After refining, this second batch is mixed with the thermoplastic fibre suspension and 60 l. of a 20% polyamide-amine-epichlorhydrin resin solution and 18 kg of predissolved sodium aluminate are added thereto.

This mixture is processed in a conventional manner on a paper machine. The pH value is adjusted to 7 before the sheet formation by means of $Al_2(SO_4)_8$. The end product has a uniformly coloured surface that satisfactorily covers the wood surface, and has a basis weight of 60 g/m². The non-woven fibre material produced in this way is conveniently smoothed at approximately 90°C by means of super calenders, whereby a thermoplasticization or a thermoplastic formation is to some extent obviated.

The calendered product is provided in a photogravure process with a wood decoration and in the same process with a lacquer coating of 3—6 g/m².

The non-woven fibre material produced in the described manner is pressed at 150°C on to the chipboard in a short cycle press, and in removed hot from the latter after 10 seconds.

In an accompanying diagram, the partially pressed, printed and lacquered non-woven fibre material is shown bonded to a chipboard. The diagram shows a chipboard 1 with a non-woven fibre material 2, which has a decorative printed layer 3 and an outer lacquer layer 4.

WHAT WE CLAIM IS:—

1. A board of wood material having a decorative layer anchored to the board surface by heat and pressure wherein the layer comprises at least one thermoplasticized sheet-like support which, prior to being anchored to the board, has a basis weight of less than 100 g/m² and comprising a non-woven fibre material containing a predominant proportion by weight of thermoplastic synthetic fibres less than 8 mm in length and at least one pigment having a refractive index greater than 2.0.

2. A board according to claim 1, wherein the sheet-like support comprises cellulose, in an amount of from 20 to 50% by weight of the total fibre weight.

3. A board according to claim 2, wherein

the sheet-like support contains one or more cationic polyamide resins to fix the pigments and thermoplastic fibres to the cellulose.

4. A board according to any one of claims 1 to 3, wherein the non-woven fibre material contains hydrophilic polyethylene and/or polypropylene fibres.

5. A board according to any one of claims 1 to 4 wherein the non-woven fibre material has a high air permeability.

6. A board according to any one of claims 1 to 5 wherein one or more of titanium dioxide, zinc sulphide, iron oxide, chromium oxide, lead chromate, lead molybdate and organic pigments are used as pigments.

7. A board according to any one of claims 1 to 6 wherein the non-woven fibre material carries a surface lacquer system, preferably of the cross-linked type.

8. A board according to any one of claims 1 to 7 wherein the wood material is chipboard.

9. A board according to any one of claims 1 to 8 wherein the decorative layer comprises a plurality of non-woven fibre materials thermoplasticized together.

10. A board according to any one of claims 1 to 9 wherein a duroplast protective layer is anchored to the surface of the thermoplasticized sheet-like support.

11. A board according to any one of claims 1 to 9 wherein the thermoplasticized sheet-like support is bonded to a duroplast base layer.

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1 SHEET *This drawing is a reproduction of the Original on a reduced scale*